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Chapter 1 Linear Motion

Finding Gravity Lab 1.4

Purpose

The purpose of this experiment is to determine the acceleration due to gravity.

Required Equipment

- Ticker timer
- Ticker timer tape
- 100-200 g mass

Discussion

A mass attached to one end of the a ticker tape and is allowed to drop through a ticker tape timer. As the tape falls, the timer leave a trail of a markings or dots all at equal intervals of time. The dots printed on the tape as it passes through the Tape Timer record the position of the mass as a function of time. To find the acceleration due to gravity, you will graph the average speed versus time. To calculate the average speeds for each time interval, use

$$\bar{v} = \frac{\Delta d}{\Delta t}$$

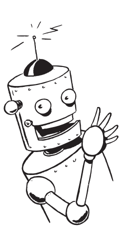
The slope of the resulting straight line is equal to the acceleration due to gravity

The Setup

1. Clamp the Tape Timer to the edge of a table using the rod and table clamp. Orient the Tape Timer on its side so the tape can pass through the Tape Timer vertically. (See Figure.)
2. Cut a piece of ticker tape as long as the distance between the timer and the floor.
3. Make a loop with one end of the paper tape by folding it over and securing it with a piece of tape. Hook the 200 g mass on the loop end of the paper tape.

Procedure

4. Thread the other end of the ticker tape through the Tape Timer until the mass is at the level of the Timer.
5. Hold the paper tape vertically above the Timer and turn on the Timer to 40 Hz.
6. Drop the tape, allowing the mass to fall tot he floor.



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Dots	Δ Time (s)	Total Time (s)	Δ Distance (m)	Total Distance (m)	Average Velocity (m/s)
1-2					
2-3					
3-4					
4-5					
5-6					
6-7					
7-8					
8-9					
9-10					
10-11					
11-12					
12-13					
13-14					
14-15					

Measuring the Change in Distance

7. Measure the position between of each of the dots. Don't use the first dot because the mass may not have begun to move when the first dot was made. Record the distance between dots under the change in distance column (Δ Distance).
8. Using the change in distance (Δ Distance) between each dot, calculate the total distance and complete the column.

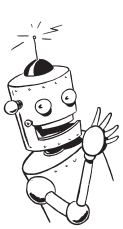
Recording Time

9. Since the Tape Timer was set on 40 Hz, it was making 40 dots per second which means that the time between dots is 1/40 second or 0.025 seconds. Record the change in time (Δ time) between each dot in the column. This number will be the same all the way down the column.
10. Using the change in time (Δ time) between each dot, calculate the total time.

Calculate the Average Velocity

11. Using the equation for average velocity, calculate the average velocity between each point and complete the data table.

$$\bar{v} = \frac{\Delta d}{\Delta t} \qquad \bar{v} = \frac{\Delta \text{ Distance}}{(0.025)}$$



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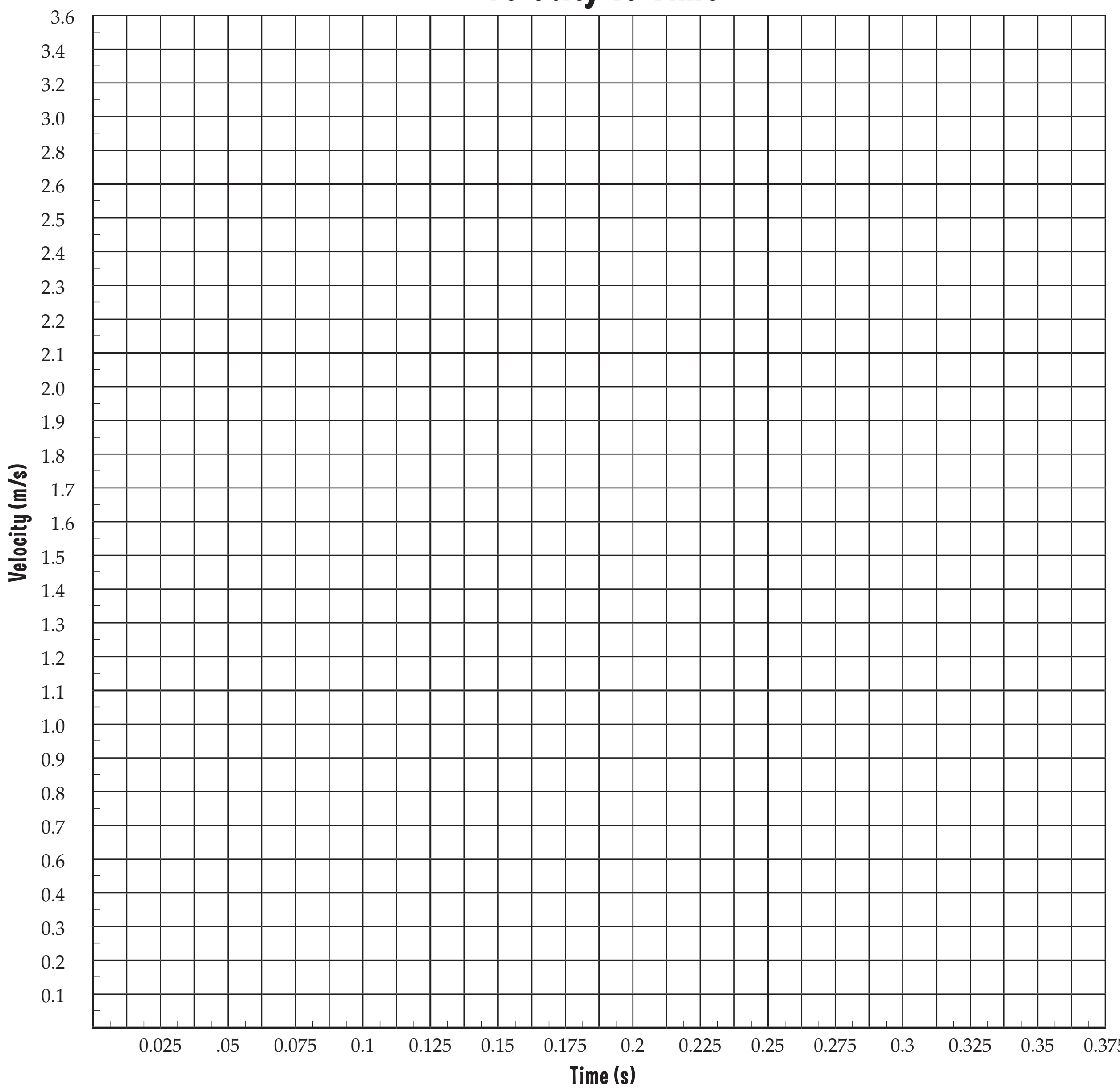
Graph the Results

12. Plot the average velocity and the total time on the graph.

13. Draw a straight, best fit line. Do not draw a connect-the-dot line. Your best fit line may not pass through each point but will show the slop of your points

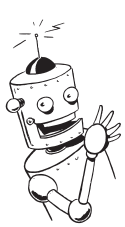
Velocity vs Time



Finding Gravity

14. The slope of velocity vs. time is acceleration, find the slope from your graph.

slope = g = ______________________ m/s^2



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Finding Gravity

Lab 1.4